

*If you are using a printed copy of this procedure, and not the on-screen version, then you **MUST** make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A*

C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

4.120.42.a. Switch Yard Critical Device Tests

C-A-OPM Procedures in which this Attachment is used.		
4.120.42		

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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Approved: _____ ***Signature on File*** _____
 Collider-Accelerator Department Chairman Date

V. Castillo

C-A-OPM-ATT 4.120.42.a. (Y)

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Revision 00
 March 10, 2006

4.120.42.a Switch Yard Critical Device Tests

PASS ANNUAL ACCEPTANCE TEST PROTOCOL

Division A Software Filename and Checksum: Title: _____ Checksum: _____

Division B Software Filename and Checksum: Title: _____ Checksum: _____

Initial testing complete:

Test Team Leader's Name (Print): _____ Life Number: _____

Test Team Leader's Name (Sign): _____ Date: ____/____/____

Acceptance test procedure complete (following repairs and retesting if required):

Test Team Leader's Name (Print): _____ Life Number: _____

Test Team Leader's Name (Sign): _____ Date: ____/____/____

Test results reviewed by:

Safety Section Head's Name (Print): _____ Life Number: _____

Safety Section Head's Name (Sign): _____ Date: ____/____/____

Test results accepted by Radiation Safety Committee:

RSC Member's Name (Print): _____ Life Number: _____

RSC Member's Name (Sign): _____ Date: ____/____/____

1.1 Setup and test of AGS F5 under power

- | | | | |
|--------------------------|---|---|----------------|
| <input type="checkbox"/> | VERIFY | AGS F5 Power Supply is | NO LOTO |
| | PLACE | “Magnets under Test” notice at South gate to AGS ring | |
| | PLACE | AGS in Controlled access (CA) | |
| <input type="checkbox"/> | VERIFY | MCR sees at Opto Monitor AGS in | CA |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK3 Tdod/3, F5 PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK4 , F5 PS OFF is | ON |
| | CLOSE | LTB Beam Stops (LtbBS) and TTB Beam Stops (TtbBS) | |
| <input type="checkbox"/> | VERIFY | LtbBS <input type="checkbox"/> and TtbBS <input type="checkbox"/> are | CLOSED |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23AK10 <input type="checkbox"/> , 23AK11 <input type="checkbox"/> , AGS beam disabled are | ON |
| | TURN ON | Feed Forward (FF) switch, S1 , in MCR | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23HK1 <input type="checkbox"/> , 23HK2 <input type="checkbox"/> , Swyd equip permissive are | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK3 , F5 PSs Intlk OK, is | ON |
| | HAVE | MCR Operator turn on AGS F5 Power supply | |
| <input type="checkbox"/> | VERIFY | AGS F5 Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK4 , F5 PS OFF is | OFF |
| | TURN OFF | At encl MCA-2 relay 23HK3 , F5 PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK3 , F5 PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | MCR sees AGS F5 Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK4 , F5 PS OFF is | OFF |
| <input type="checkbox"/> | VERIFY | Attempt to turn on AGS F5 Power Supply | FAIL |
| | TURN ON | At encl MCA-2 relay 23HK3 , F5 PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK3 , F5 PS Intlk OK, is | ON |
| | HAVE | MCR Operator turn on AGS F5 Power supply | |
| <input type="checkbox"/> | VERIFY | MCR sees AGS F5 Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK4 , F5 PS OFF is | OFF |
| | HAVE | MCR Operator turn off AGS F5 Power supply | |
| <input type="checkbox"/> | VERIFY | AGS F5 Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK4 , F5 PS OFF is | ON |
| <input type="checkbox"/> | Check for acceptance of Setup and test of AGS F5 under power | | |

1.2 Setup and test of AGS F10 under power

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|--------------------------|--|---|----------------|
| <input type="checkbox"/> | VERIFY | AGS F5 Power Supply is | NO LOTO |
| <input type="checkbox"/> | VERIFY | “Magnets under Test” notice at South gate to AGS ring | |
| <input type="checkbox"/> | PLACE | AGS in Controlled access (CA) | |
| <input type="checkbox"/> | VERIFY | MCR sees at Opto Monitor AGS in | CA |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK5 Tdod/3, F10 PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK6 , F10 PS OFF is | ON |
| <input type="checkbox"/> | CLOSE | LTB Beam Stops (LtbBS) and TTB Beam Stops (TtbBS) | |
| <input type="checkbox"/> | VERIFY | LtbBS <input type="checkbox"/> and TtbBS <input type="checkbox"/> are | CLOSED |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23AK10 <input type="checkbox"/> , 23AK11 <input type="checkbox"/> , AGS beam disabled are | ON |
| | TURN ON | Feed Forward (FF) switch, S1 , in MCR | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23HK1 <input type="checkbox"/> , 23HK2 <input type="checkbox"/> , Swyd equip permissive are | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK5 , F10 PSs Intlk OK, is | ON |
| <input type="checkbox"/> | HAVE | MCR Operator turn on AGS F10 Power supply | |
| <input type="checkbox"/> | VERIFY | AGS F10 Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK6 , F10 PS OFF is | OFF |
| <input type="checkbox"/> | TURN OFF | At encl MCA-2 relay 23HK5 , F10 PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK5 , F10 PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | MCR sees AGS F10 Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK6 , F10 PS OFF is | OFF |
| <input type="checkbox"/> | VERIFY | Attempt to turn on AGS F10 Power Supply | FAIL |
| <input type="checkbox"/> | TURN ON | At encl MCA-2 relay 23HK5 , F10 PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK5 , F10 PS Intlk OK, is | ON |
| <input type="checkbox"/> | HAVE | MCR Operator turn on AGS F10 Power supply | |
| <input type="checkbox"/> | VERIFY | MCR sees AGS F10 Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK6 , F10 PS OFF is | OFF |
| <input type="checkbox"/> | HAVE | MCR Operator turn off AGS F10 Power supply | |
| <input type="checkbox"/> | VERIFY | AGS F10 Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK6 , F10 PS OFF is | ON |
| <input type="checkbox"/> | Check for acceptance of Setup and test of AGS F10 under power | | |

1.3 Setup and test of AGS F10 Bumps under power

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|--------------------------|--|---|----------------|
| <input type="checkbox"/> | VERIFY | AGS F10 Bumps Power Supply is | NO LOTO |
| | PLACE | “Magnets under Test” notice at South gate to AGS ring | |
| | PLACE | AGS in Controlled access (CA) | |
| <input type="checkbox"/> | VERIFY | MCR sees at Opto Monitor AGS in | CA |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK7 Tdod/3 , F10 Bumps PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK8 , F10 Bumps PS OFF is | ON |
| | CLOSE | LTB Beam Stops (LtbBS) and TTB Beam Stops (TtbBS) | |
| <input type="checkbox"/> | VERIFY | LtbBS <input type="checkbox"/> and TtbBS <input type="checkbox"/> are | CLOSED |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23AK10 <input type="checkbox"/> , 23AK11 <input type="checkbox"/> , AGS beam disabled are | ON |
| | TURN ON | Feed Forward (FF) switch, S1 , in MCR | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23HK1 <input type="checkbox"/> , 23HK2 <input type="checkbox"/> , Swyd equip permissive are | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK7 , F10 Bumps PSs Intlk OK, is | ON |
| | HAVE | MCR Operator turn on AGS F10 Bumps Power supply | |
| <input type="checkbox"/> | VERIFY | AGS F10 Bumps Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK8 , F10 Bumps PS OFF is | OFF |
| | TURN OFF | At encl MCA-2 relay 23HK7 , F10 Bumps PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK7 , F10 Bumps PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | MCR sees AGS F10 Bumps Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK8 , F10 Bumps PS OFF is | OFF |
| <input type="checkbox"/> | VERIFY | Attempt to turn on AGS F10 Bumps Power Supply | FAIL |
| | TURN ON | At encl MCA-2 relay 23HK7 , F10 Bumps PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK7 , F10 Bumps PS Intlk OK, is | ON |
| | HAVE | MCR Operator turn on AGS F10 Bumps Power supply | |
| <input type="checkbox"/> | VERIFY | MCR sees AGS F10 Bumps Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK8 , F10 Bumps PS OFF is | OFF |
| | HAVE | MCR Operator turn off AGS F10 Bumps Power supply | |
| <input type="checkbox"/> | VERIFY | AGS F10 Bumps Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK8 , F10 Bumps PS OFF is | ON |
| <input type="checkbox"/> | Check for acceptance of Setup and test of AGS F10 Bumps under power | | |

1.3 Setup and test of AGS SEB Sextupoles under power

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|--------------------------|-----------------|---|----------------|
| <input type="checkbox"/> | VERIFY | AGS SEB Sextupoles Power Supply is | NO LOTO |
| | PLACE | “Magnets under Test” notice at South gate to AGS ring | |
| | PLACE | AGS in Controlled access (CA) | |
| <input type="checkbox"/> | VERIFY | MCR sees at Opto Monitor AGS in | CA |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK9 Tdod/3, SEB Sextupoles PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK10 , SEB Sextupoles PS OFF is | ON |
| | CLOSE | LTB Beam Stops (LtbBS) and TTB Beam Stops (TtbBS) | |
| <input type="checkbox"/> | VERIFY | LtbBS <input type="checkbox"/> and TtbBS <input type="checkbox"/> are | CLOSED |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23AK10 <input type="checkbox"/> , 23AK11 <input type="checkbox"/> , AGS beam disabled are | ON |
| | TURN ON | Feed Forward (FF) switch, S1 , in MCR | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relays: 23HK1 <input type="checkbox"/> , 23HK2 <input type="checkbox"/> , Swyd equip permissive are | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK9 , SEB Sextupoles PSs Intlk OK, is | ON |
| | HAVE | MCR Operator turn on AGS SEB Sextupoles Power supply | |
| <input type="checkbox"/> | VERIFY | AGS SEB Sextupoles Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK10 , SEB Sextupoles PS OFF is | OFF |
| | TURN OFF | At encl MCA-2 relay 23HK9 , SEB Sextupoles PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK9 , SEB Sextupoles PS Intlk OK, is | OFF |
| <input type="checkbox"/> | VERIFY | MCR sees AGS SEB Sextupoles Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK10 , SEB Sextupoles PS OFF is | OFF |
| <input type="checkbox"/> | VERIFY | Attempt to turn on AGS SEB Sextupoles Power Supply | FAIL |
| | TURN ON | At encl MCA-2 relay 23HK9 , SEB Sextupoles PS Intlk OK | |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK9 , SEB Sextupoles PS Intlk OK, is | ON |
| | HAVE | MCR Operator turn on AGS SEB Sextupoles Power supply | |
| <input type="checkbox"/> | VERIFY | MCR sees AGS SEB Sextupoles Power Supply is | ON |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK10 , SEB Sextupoles PS OFF is | OFF |
| | HAVE | MCR Operator turn off AGS SEB Sextupoles Power supply | |
| <input type="checkbox"/> | VERIFY | AGS SEB Sextupoles Power Supply is | OFF |
| <input type="checkbox"/> | VERIFY | At encl MCA-2 relay 23HK10 , SEB Sextupoles PS OFF is | ON |
| | REMOVE | “Magnets under Test” notice from South gate to AGS ring | |

- ☐ **Check for acceptance of Setup and test of AGS SEB Sextupoles under power**

1.4 Test of AGS Beam Disabled relay logic string – Dwg: D40-E311

PERFORM Visual check on relays for **welded contacts** during activation

- ☐ **VERIFY** Normally Open (NO) **contacts** for relays are **OK**
☐ **VERIFY** Normally Closed (NC) **contacts** for relays are **OK**

SET All relays in logic string so that **relays: 23AK10 and 23AK11 are ON**

TURN ON/OFF Each relay , in turn, to verify logic in Table -1 below

AGS Beam Disab. 3K339 in MTR**	AGS Beam Disab. 3K340 in MTR	AGS Beam Disab. 23AK10 in MCA-2*	AGS Beam Disab. 23AK11 in MCA-2
ON	ON	ON	ON
OFF	ON	OFF	OFF
ON	OFF	OFF	OFF

Table 1 - Logic states of relays controlling AGS Beam Disabled

- ☐ Check for acceptance of Test of AGS Beam Disabled relay logic string

* MCA-2 = MCR cage area 3; ** MTR = MCR Terminal room

1.5 Test of SEB Security Interlock on AGS, relays 23AK9 & 30WK5, logic string – Dwg: D40-E311

PERFORM Visual check on relays for **welded contacts** during activation

- ☐ **VERIFY** Normally Open (NO) **contacts** for relays are **OK**
☐ **VERIFY** Normally Closed (NC) **contacts** for relays are **OK**

SET All relays in logic string so that **relays: 23AK9 and 30WK5 are ON**

TURN ON/OFF Each relay , in turn, to verify logic in Tables -2 and 3 below; use grouping as necessary

Relay	Location	Function	Verify for 23AK9 and 30WK5 to be ON all relays must be	Verify for 23AK9 and 30WK5 to be OFF any relay must be
23BK10	MCA-2 note 3	Swyd/AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23MK16	MCA-2	C'munk A-Tgt Headwall	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
30UK11	MCA-3	SEB C'munks OK	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
30UK12	MCA-3	SEB C'munks OK.	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23GK1 or 23GK3	MCA-3	F10 Security Beam Clearance	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
24WK10	MCA-3	Swyd lights out common	ON <input type="checkbox"/>	OFF <input type="checkbox"/>

Table 2 - Logic states of relays controlling SEB Security Interlock on AGS

Relay	Location	Function	Verify for 23AK9 and 30WK5 to be ON all relays must be	Verify for 23AK9 and 30WK5 to be OFF any relay must be
23BK6	MCA-2 note 3	Swyd Equip safely Off	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23BK7	MCA-2	Swyd equip safely Off	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23GK1 or 23GK3	MCA-3	F10 Security Beam Clearance	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
24WK10	MCA-3	Swyd lights out common	ON <input type="checkbox"/>	OFF <input type="checkbox"/>

Table 3 - Logic states of relays controlling SEB Security Interlock on AGS, Alternate path

Notes on Locations:

1. MTR - MCR Terminal room
2. MCA-1 MCR cage area 1
3. MCA-2 MCR cage area 2
4. MCA-3 MCR cage area 3
5. MCA-3-O MCR cage area 3 outside

- ☐ Check for acceptance of Test of SEB Security Interlock on AGS, relays 23AK9 & 30WK5, logic string

1.6 Test of SEB Security Interlock on AGS redundant, relay 23AK8, logic string – Dwg: D40-E311

PERFORM Visual check on relays for **welded contacts** during activation

- ☐ **VERIFY** Normally Open (**NO**) **contacts** for relays are **OK**
☐ **VERIFY** Normally Closed (**NC**) **contacts** for relays are **OK**

SET All relays in logic string so that **relay 23AK8 is ON**

TURN ON/OFF **Each relay , in turn, to verify logic in Table -4 below; use grouping as necessary**

Relay	Location	Function	Verify for 23AK8 to be ON all relays must be	Verify for 23AK8 OFF any relay must be
23BK11	MCA-2 note 3	Swyd/AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23XK5	MCA-2	A-Tgt Cave secured	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
24WK10	MCA-3	Swyd lights out common	ON <input type="checkbox"/>	OFF <input type="checkbox"/>

Table 4 - Logic states of relays controlling SEB Security Interlock on AGS redundant

- ☐ **Check for acceptance of Test of SEB Security Interlock on AGS redundant relay 23AK8, logic string**

1.7 Test of Security Intlk on SEB, relays 23BK10 and 23BK11, logic string – Dwg: D40-E313

PERFORM Visual check on relays for **welded contacts** during activation

- ☐ **VERIFY** Normally Open (**NO**) **contacts** for relays are **OK**
☐ **VERIFY** Normally Closed (**NC**) **contacts** for relays are **OK**

SET All relays in logic string so that **relays 23BK10 and 23BK11 are ON**

TURN ON/OFF **Each relay , in turn, to verify logic in Table -5 below; use grouping as necessary**

Relay	Location	Function	Verify for 23BK10 and 23BK11 to be ON all relays must be	Verify for 23BK10 and 23BK11 to be OFF any relay must be
23CK11	MCA-2	A-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23CK12	MCA-2	A-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23DK11	MCA-2	B-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23DK12	MCA-2	B-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23EK11	MCA-2	C-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23EK12	MCA-2	C-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23FK11	MCA-2	D-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23FK12	MCA-2	D-line AGS Security Intlk	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23IK11	MCA-2	Swyd & A-Tgt cave Secured	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
23IK12	MCA-2	Swyd & A-Tgt cave Secured	ON <input type="checkbox"/>	OFF <input type="checkbox"/>
24WK14	MCA-2	Swyd lights out common	ON <input type="checkbox"/>	OFF <input type="checkbox"/>

Table 5 - Logic states of relays controlling Security Intlk on SEB

- ☐ Check for acceptance of Test of Security Intlk on SEB, relays 23BK10 and 23BK11, logic string

END OF TEST PROCEDURE

TTL: Sign for completion of initial testing: _____

Date: ____/____/____

TTL: Sign for completion of final testing: _____

Date: ____/____/____